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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/586,543

07/19/2006

Yasuhito Urashima

Q79654

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23373 7590 01/07/2010  
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EXAMINER

AHMED, SELIM U

ART UNIT

PAPER NUMBER

2826

NOTIFICATION DATE

DELIVERY MODE

01/07/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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PPROCESSING@SUGHRUE.COM  
USPTO@SUGHRUE.COM

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/586,543	URASHIMA, YASUHITO	
	<b>Examiner</b>	<b>Art Unit</b>	
	SELIM AHMED	2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 September 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 16,17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

1. Applicant's remark filed on 09/08/2009 is acknowledged. The claims 1-15 remain original as no amendment was made with the remark. Applicant's arguments have been fully considered but they are not persuasive. So, the rejection made on 06/08/2009 is repeated here with clarifications and arguments made by applicant are rebutted under this office action.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 3, 5-10, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sunakawa et al (US 2003/0207125; Sunakawa hereinafter) in view of Ishida (US 6,864,158; Ishida hereinafter).

With regard to claim 1, Sunakawa discloses a Group III nitride (e.g. Abstract) semiconductor multilayer structure (e.g. Figs. 1A-1F) comprising a substrate 11; an  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  ( $0 \leq x \leq 1$ ) buffer layer 12 which is provided on the substrate 11 and has a columnar or island-like crystal structure (e.g. Fig. 1C,

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para[0107]); and an  $\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{N}$  ( $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$ ,  $(0 \leq x + y \leq 1)$ ) single-crystal layer 15 provided on the buffer layer 12, wherein the substrate 11 has, on its surface, non-periodically (e.g. Figs. 1C-1F show non-periodic grooves) distributed grooves 14.

As discussed above, Sunakawa discloses all of the limitations of claim 1 with the exception of the groove 14 having an average depth of 0.01 to 5  $\mu\text{m}$ . In para[0107] of Sunakawa discloses that groove 14 is formed during Phosphoric acid and Sulfuric acid etch (1:1 volume ratio) of GaN layer 12 since the acid ratio also etches sapphire substrate 11. However, for example, in Fig. 1C, col.9, lines 51-57 of Ishida discloses the sapphire substrate 11 was etched to form groove 11 to a depth of 0.1 to 1  $\mu\text{m}$ . Applicant is reminded that a prima facie case of obviousness typically exists when the ranges of the claimed composition overlap the ranges disclosed in the prior art or when the ranges of the claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05. [*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir.2003). >See also *In re Harris*, 409 F.3d 1339, 74 USPQ2d 1951 (Fed. Cir. 2005); *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004).]

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Therefore, Applicant's claim 1 does not distinguish over the Sunakawa (in view of Ishida) reference.

Furthermore, it would have been obvious to one of ordinary skill in the art to form the groove having an average depth of 0.01 to 5 um through routine experimentation of the etching chemistry/parameters. It is well known in the semiconductor fabrication process to optimize the etching thickness of any particular parameter within a technology using design of experiment (DOE) technique to meet certain product specific performance and reliability. Moreover, there is no evidence indicating the ranges of the height of the thickness is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicants must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir.1990).

With regard to claim 2, Fig. 1C, col.9, lines 51-57 of Ishida discloses a Group III nitride semiconductor multilayer structure according to claim 1, wherein the grooves have an average depth of 0.1 to 1 um.

With regard to claim 3, Sunakawa (in view of Ishida) discloses all of the limitations of claim 1, with the exception of the Group III nitride semiconductor multilayer structure wherein the substrate is formed of sapphire single crystal or SiC single crystal. Sunakawa discloses the Group III nitride semiconductor multilayer structure, wherein the substrate is formed of sapphire crystal, however. It would have been obvious to one having ordinary skill in the art at the time of the invention to use single crystal sapphire substrate for superior electrical properties.

With regard to claim 5, e.g. para[0075] of Sukanawa (in view of Ishida) discloses a Group III nitride semiconductor multilayer structure according to claim 1, wherein the buffer layer has a thickness of 1 to 100 nm.

With regard to claim 6, e.g. para[0106] of Sunakawa discloses a Group III nitride semiconductor multilayer structure according to claim wherein the buffer layer is formed through continuously feeding of a Group III element source and a nitrogen source or through feeding of merely a Group III element source (in the case where the nitrogen/Group III element ratio is zero). Sunakawa does not disclose the ratio of nitrogen to a Group III element becomes 1,000 or less explicitly. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the ratio of nitrogen to a Group III

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element becomes 1,000 or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379. Furthermore, Applicant's claim 6 does not distinguish over the Sunakawa (in view of Ishida) reference regardless of the process used to form the buffer layer because only the final product is relevant, not the process of making such as "formed through continuously feeding of a Group III element source and a nitrogen source or through feeding of merely a Group III element source". Note that a "product by process claim" is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also MPEP 706.03(e).

Furthermore, applicant's claim 6 does not distinguish over the Sunakawa's reference regardless of the process used to form the Group III nitride semiconductor multilayer structure because only the final product is relevant, not the process of making such as, formed through specific gas ratio. Note that a "product by process claim" is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al.*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

With regard to claim 7, Sunakawa (in view of Ishida) discloses the claimed invention except for the single-crystal layer has a thickness of 1 to 20  $\mu\text{m}$ . Sunakawa discloses the single crystal layer has a thickness of 8  $\mu\text{m}$  or more (para[0109]). Applicant is reminded that a prima facie case of obviousness typically exists when the ranges of the claimed composition overlap the ranges disclosed in the prior art or when the ranges of the claimed composition do not



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overlap but are close enough such that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05. [*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir.2003). >See also *In re Harris*, 409 F.3d 1339, 74 USPQ2d 1951 (Fed. Cir. 2005); *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004).]. In para[0135], Sunakawa further discloses, "In order to preferably form the particulate GaN film, the thickness of the GaN film is preferably appropriately set in accordance with a temperature raising speed, growth temperature, and H<sub>2</sub> or NH<sub>3</sub> partial pressure". It would have been obvious to one of ordinary skill in the art at the time the invention was made to grow 1 to 20 um of single crystal, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. See also *In re Peterson*, 65 USPQ2d 1379.

With regard to claim 8, e.g. para[0108] of Sunakawa discloses A Group III nitride semiconductor multilayer structure according to claim 1 wherein the single-crystal layer is formed through feeding of a Group III element source and a nitrogen source.

As discussed above, Sunakawa does not disclose the nitrogen/Group III element ratio becomes 1,600 to 3,200. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the nitrogen/Group III element ratio from 1,600 to 3,200 since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379.

Furthermore, applicant's claim 8 does not distinguish over the Sunakawa's reference regardless of the process used to form the Group III nitride semiconductor multilayer structure because only the final product is relevant, not the process of making such as, formed through specific gas ratio. Note that a "product by process claim" is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law

makes clear. See also MPEP 706.03(e).

With regard to claim 9, Sunakawa does not disclose a Group III nitride semiconductor multilayer structure according to claim 1 wherein the single-crystal layer is formed while the temperature of the substrate is regulated so as to fall within a range of 1,000 to 1,300°C. Sunakawa discloses the temperature range from 600C to 1040C (para[0108]) rather. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the temperature of the substrate is regulated so as to fall within a range of 1,000 to 1,300°C since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379.

Furthermore, applicant's claim 9 does not distinguish over the Sunakawa's reference regardless of the process used to form the Group III nitride semiconductor multilayer structure because only the final product is relevant, not the process of making such as, formed through specific temperature. Note that a "product by process claim" is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554

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does not deal with this issue); and *In re Marosi et al.*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

With regard to claim 10, Sunakawa (in view of Ishida) discloses the claimed invention except for the temperature of the substrate regulated so as to fall within a range of 1,050 to 1,200°C. It would have been obvious to one of ordinary skill in the art at the time the invention was made to regulate the temperature within 1,050 to 1,200°C, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. See also *In re Peterson*, 65 USPQ2d 1379.

With regard to claim 13, Sunakawa discloses a substrate 11 for forming a Group III nitride semiconductor, which has, on its surface, non-periodically (e.g. Figs. 1C-1F show non-periodic grooves) distributed grooves 12.

As discussed above, Sunakawa discloses all of the limitations of claim 13 with the exception of the groove 14 having an average depth of 0.01 to 5  $\mu\text{m}$ . In para[0107] of Sunakawa discloses that groove 14 is formed during Phosphoric acid and Sulfuric acid etch (1:1 volume ratio) of GaN layer 12 since the acid ratio also etches sapphire substrate 11. However, for example, in Fig. 1C, col.9, lines 51-57 of Ishida discloses the Sapphire substrate 11 was etched to form groove 11 to a depth of 0.1 to 5  $\mu\text{m}$ . Applicant is reminded that a prima facie case of obviousness typically exists when the ranges of the claimed composition overlap the ranges disclosed in the prior art or when the ranges of the claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05. [*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir.2003). >See also *In re Harris*, 409 F.3d 1339, 74 USPQ2d 1951 (Fed. Cir. 2005); *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004).]

Therefore, Applicant's claim 13 does not distinguish over the Sunakawa (in view of Ishida) reference. Furthermore, it would have been obvious to one of ordinary skill in the art to form the groove having an average depth of 0.01 to 5  $\mu\text{m}$  through routine experimentation of the etching chemistry/parameters. It is well known in the semiconductor fabrication process to optimize the etching thickness of any particular parameter within a technology using design of experiment

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(DOE) technique to meet certain product specific performance and reliability. Moreover, there is no evidence indicating the ranges of the height of the thickness is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicants must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir.1990).

With regard to claim 14, Fig. 1C, col.9, lines 51-57 of Ishida discloses a substrate for forming a Group III nitride semiconductor according to claim 13, wherein the grooves have an average depth of 0.1 to 1  $\mu\text{m}$ .

With regard to claim 15, Sunakawa (in view of Ishida) discloses all of the limitations of claim 13 respectively, with the exception of the Group III nitride semiconductor multilayer structure wherein the substrate is formed of sapphire single crystal or SiC single crystal. Sunakawa discloses the Group III nitride semiconductor multilayer structure, wherein the substrate is formed of sapphire crystal, however. It would have been obvious to one having ordinary skill in the

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art at the time of the invention to use single crystal sapphire substrate for superior electrical properties.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sunakawa in view of Cuomo et al (US 2002/0078881; Cuomo hereinafter).

With regard to claim 4, Sunakawa discloses all of the limitations of claim 1 with the exception of a Group III nitride semiconductor multilayer structure according to claim 1, wherein the buffer layer contains columnar crystal grains. However, e.g. Fig. 4, element 14, para[00041] of Cuomo discloses a buffer layer with columnar crystal grains. Para [00041] of Cuomo discloses, "It is another object of the present invention to provide such columnar structures as strain-relieving buffer or transition layers or seed crystals for the growth of additional low-defect density Group III materials thereon." It would have been obvious to one having ordinary skill in the art at the time of the invention to include columnar structure buffer layer such as taught by Cuomo et al. within Sunakawa's device for predictable results.

4. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sunakawa in view of Uemura et al (US 6,917,059; Uemura hereinafter).

With regard to claim 11, Sunakawa discloses all of the limitations of claim 1 with the exception of a Group III nitride semiconductor light-emitting device comprising a Group III nitride semiconductor multilayer structure according to claim 1; Group III nitride semiconductor layers provided atop the single-crystal layer of the semiconductor multilayer structure, the semiconductor layers including an n-type layer, a light-emitting layer, and a p-type layer; and a negative electrode and a positive electrode which are provided at predetermined positions. However, Fig. 2 of Uemura discloses a Group III nitride semiconductor light-emitting device (Fig. 2) comprising a Group III nitride semiconductor (Abstract) multilayer structure according to claim 1; Group III nitride semiconductor layers 23, 24, 25 (col.6, lines 46-50 disclosed that 23 may have a double layer structure) provided atop the single-crystal layer 23 of the semiconductor multilayer structure, the semiconductor layers including an n-type layer 23, a light-emitting layer 24, and a p-type layer 25; and a negative electrode 26 and a positive electrode 28 which are provided at predetermined positions. It would have been obvious to one having ordinary skill in the art at the time of the invention to include Uemura's an n-type layer 23, a light-emitting layer 24, and a p-type layer 25; and a negative electrode 26 and a positive electrode 28 at a predetermined position to form a LED structure.

With regard to claim 12, e.g. Fig. 2 of Uemura discloses a Group III nitride semiconductor light-emitting device according to claim 11, wherein the n-type



layer 23, the light-emitting layer 24, and the p-type layer 25, which constitute the Group III nitride semiconductor layers, are successively provided atop the single-crystal layer in this order (col.6, lines 46-50 disclosed that 23 may have a double layer structure); the negative electrode 26 is provided on the n-type layer 23; and the positive electrode 28 is provided on the p-type layer 25.

### ***Response to Arguments***

5. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

On page 6 of the remark filed on 09/08/2009, applicant argued, "The average depth of the groove recited in claim 1 is not a mere matter of optimization under §103(a). Specifically, a particular parameter must be recognized as a result-effective variable, before the optimum ranges of the variable might be characterized as routine experimentation. See MPEP § 2144.05. In this regard, the Examiner has not established that the average depth of the groove is a result-effective parameter, as evidenced by Sunakawa's complete silence with regard to the average depth of the grooves".

However, applicant's above argument found not persuasive. As indicated in the rejection, although Sunakawa is silent about the groove depth, in para[0107] of Sunakawa discloses that groove 14 is formed during Phosphoric

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acid and Sulfuric acid etch (1:1 volume ratio) of GaN layer 12 since the acid ratio also etches sapphire substrate 11. As can be seen from Fig. 1, the grooves 14 have some (different) depths which Sunakawa is silent about. According to Fig. 1, the depths of the grooves 14 are not identical i.e. rightmost groove is shallower than the leftmost groove. So, it can be said that Sunakawa's grooves having depths with unknown range. Since Sunakawa's grooves having some depths with unknown range, it is reasonable to say that the average depth (or depths) of the groove is a result-effective variable. Furthermore, for example, in Fig. 1C, col.9, lines 51-57 of Ishida discloses the sapphire substrate 11 was etched to form groove 11 to a depth of 0.1 to 1 um. Since Ishida discloses the range of the groove being 0.1 to 1 um, the average depth of the groove is a result-effective variable. Furthermore, Ishida discloses a range of the groove 0.1 to 1 um whereas the claim requires the range to be 0.01 um to 5 um. Applicant is reminded that a prima facie case of obviousness typically exists when the ranges of the claimed composition overlap the ranges disclosed in the prior art or when the ranges of the claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05. [*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir.2003). >See also *In re Harris*, 409 F.3d 1339, 74 USPQ2d 1951 (Fed. Cir. 2005); *Iron*

*Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004).].

On page 6 of the remark filed on 09/08/2009, applicant argued, "Further, Ishida is not properly combinable with Sunakawa. In Ishida, the grooves 11 a having a depth of 0.1 gm are formed by RIE (dry) etching, different from the wet etching employed by Sunakawa. The use of the dry etching technique of Ishida in place of the wet etching technique of Sunakawa would render Sunakawa unsuitable for its intended purpose."

However, applicant's above argument found not persuasive. In this case, Ishida was cited as a secondary reference to show the depths (average) of the groove not whether the groove was formed by wet etch or RIE etch. Since the argued claim 1 is a product claim not a process claim, how (which process) the depth of the groove is formed is irrelevant. So, the examiner believes that combining the Ishida reference to show the depth of the groove is proper.

### ***Conclusion***

6. **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SELIM AHMED whose telephone number is (571)270-5025. The examiner can normally be reached on 9:00 AM-6:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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